

المستوي الثالث / حيوان و كيمياء  
مقرر: خلية و بيولوجيا جزينية (301 ح)

Date: 10-01-2023

Time: 2 Hours

Marks: 90

الإمتحان في 3 صفحات:

**Answer ALL the following questions:**

**QUESTION (1):**

(20 Marks)

Which of the following statements are probably true (√) and which are probably false (×).

**DO NOT copy the sentences to your answer sheet**

- 1- The aliphatic chains of fatty acids are hydrophilic.
- 2- Sphingolipids contain a double bond between C5 and C6 in the hydrocarbon tail.
- 3- Triglycerides are incorporated into membrane bilayers.
- 4- Annexins bind tightly to membrane lipid bilayer through a GPI anchor.
- 5- Adenosine is a nucleotide that exists in both DNA and RNA.
- 6- A phosphodiester linkage involves a phosphate attachment to the 5' carbon in one nucleotide and to the 3' carbon in the other.
- 7- Peripheral membrane proteins have hydrophilic residues exposed on their surfaces and a core of hydrophobic residues.
- 8- Transmembrane segments of integral membrane proteins that cross the bilayer more than once are folded into  $\alpha$ -helices or  $\beta$ -strands.
- 9- Cytochrome oxidase is an integral membrane protein with  $\alpha$ -helical transmembrane segments.
- 10- Myristoyl tails are added to the amino group of an N-terminal glycine during the biosynthesis of some peripheral membrane proteins.
- 11- Interactions with ions, small molecules, or large proteins may influence RNA tertiary structure.
- 12- More than half of the fatty acids in membranes have one or more double bonds.
- 13- The ribosomal binding site of bacterial mRNAs is a Shine-Dalgarno sequence.
- 14- After their synthesis, tRNAs must be modified at both the 5' and 3' ends to produce mature, functional tRNAs.
- 15- Helicases bind to single-stranded DNA and travel along in a 3' to 5' direction.
- 16- All the codons within mRNA are recognized by tRNA.
- 17- Chargaff assumed that the chemical linkage between two nucleotides is always the same.

18- PolyA tail of mRNA is encoded in the sequence of the encoding gene.

19- The 40S and 60S subunits associate to form an 80S ribosome within the nucleolus.

20- DNA polymerase can begin DNA synthesis by linking together two individual nucleotides.

**QUESTION (2):**

**(25 Marks)**

Complete the following with suitable words:

**DO NOT copy the sentences to your answer sheet**

- \_\_\_\_ (1) \_\_\_\_ serve as sources of arachidonic acid for signaling reactions. Enzymes that interconvert all phosphoglyceride head groups and remodel fatty acid chains are located on the cytoplasmic surface of the \_\_\_\_ (2) \_\_\_\_.
- \_\_\_\_ (3) \_\_\_\_ is a kind of RNA that is found in eukaryotes and it is necessary in the targeting of proteins to the endoplasmic reticulum.
- \_\_\_\_ (4) \_\_\_\_ is a six-subunit protein complex that binds directly to ARS elements and acts as the initiator of eukaryotic DNA replication.
- \_\_\_\_ (5) \_\_\_\_ charge tRNAs by attaching the appropriate amino acid.
- Isoprenoid tail is added to the side chain of a \_\_\_\_ (6) \_\_\_\_ residue near the \_\_\_\_ (7) \_\_\_\_-terminus of the protein.
- \_\_\_\_ (8) \_\_\_\_ is 3-nucleotide sequence within the mRNA that specifies a particular amino acid.
- \_\_\_\_ (9) \_\_\_\_ rRNA is responsible for catalyzing bond formation between adjacent amino acids.
- \_\_\_\_ (10) \_\_\_\_ tRNAs are two or more tRNAs differing at the third base of the anticodon and they are able to recognize the same codon.
- *Trypanosoma brucei* covers itself with a high concentration of a \_\_\_\_ (11) \_\_\_\_ protein.
- \_\_\_\_ (12) \_\_\_\_ was the first scientist to propose ball and stick model.
- According to Kozak's rules, a \_\_\_\_ (13) \_\_\_\_ at the position +4 and a \_\_\_\_ (14) \_\_\_\_ at the position -3 are the most important for start codon selection.
- Histones are synthesized during the \_\_\_\_ (15) \_\_\_\_ phase of the cell cycle.
- Moving the polypeptide from the tRNA in the P site to the amino acid at the A site is catalyzed by an enzyme known as \_\_\_\_ (16) \_\_\_\_.
- Stop codons are recognized by proteins known as \_\_\_\_ (17) \_\_\_\_.
- Band 3 and glycophorin anchor an actin-binding protein called \_\_\_\_ (18) \_\_\_\_ to the RBC membrane.
- The coding sequences within eukaryotic genes are separated by other untranslatable DNA sequences called \_\_\_\_ (19) \_\_\_\_.
- The enzyme \_\_\_\_ (20) \_\_\_\_ removes supercoils ahead of the replication fork.



- Catenins bind to transmembrane cell adhesion proteins called \_\_\_\_ (21) \_\_\_\_.
- The exchange of DNA polymerase  $\alpha$  for  $\delta$  or  $\epsilon$  is called \_\_\_\_ (22) \_\_\_\_.
- The enzyme that covalently attaches adjacent DNA fragments is called \_\_\_\_ (23) \_\_\_\_.
- When uracil is attached to a sugar, this nucleoside is called \_\_\_\_ (24) \_\_\_\_.
- The phosphoglyceride that contain choline as a head group is named \_\_\_\_ (25) \_\_\_\_.

**QUESTION (3):**

**(20 Marks)**

**Answer the following:**

- 1- What is alternative splicing? What is its biological significance? **(4 marks)**
- 2- Summarize the events that occur during initiation step of transcription process. **(5 marks)**
- 3- An RNA transcript has the following sequence:  
 $5' - \text{GGCAUGCAUUACGGCAUCACACUAGGGGAUC} - 3'$ 
  - i- What is the sequence of the template and coding strands of the DNA that encodes this RNA?
  - ii- On which side (5' or 3') of the template strand is the promoter located? **(5 marks)**
- 4- Briefly explain the molecular modifications that occur to primary RNA transcripts. **(6 marks)**

**QUESTION (4):**

**(25 Marks)**

**Answer the following:**

- 1- What are the features that should exist in a material to fulfill the role of a genetic material? **(4 marks)**
- 2- Discuss the contribution of Rosalind Franklin to the discovery of the double helix. **(6 marks)**
- 3- Discuss one example for how proteins control the characteristics of living cells. **(6 marks)**
- 4- Discuss the experiment that proved that DNA is the transformation principle. **(9 marks)**

**Best Wishes,,,,,**

**Examiner: Prof. Ahmed M. Ghoneim**